

We claim:

1. In a display comprising an element that carries a holographic pattern of a diffraction grating which element is associated with a source energizable for movement of said element, wherein said holographic pattern is moved by movement of said element and wherein movement of said holographic pattern diffracts energy incident on said holographic pattern to generate different select diffracted energies from said holographic pattern, the improvement which comprises:

said element includes a magnetic component and said holographic pattern and has a pivot point; and

said source is fixed relative to said element and comprises one or more electrically energizable coils magnetically coupled with said magnetic component, said source being energizable to cause said element carrying said holographic pattern to rotate about said pivot point.

2. The display of claim 1, wherein said select diffracted energies are projected by a projection system.

3. The display of claim 1, wherein the center of gravity of said element is the location of said pivot point.

4. The display of claim 1, wherein said pivot point is spaced-apart from the center of gravity of said element.

5. The display of claim 1, wherein said one or more electrically energizable coils each consist of multiple turns.

6. The display of claim 1, wherein said one or more electrically energizable coils each consist of a single turn.

7. The display of claim 1, wherein said magnetic component comprises a permanent magnet having principal dimensions commensurate with said diffraction grating and said diffraction grating is affixed to said magnet.

8. The display of claim 1, wherein said magnetic component and said diffraction grating are affixed to a carrier having a first surface, a second surface; a first edge, and a second edge.

5 9. The display of claim 8, wherein said diffraction grating is disposed along said first surface and said magnetic component is a permanent magnet disposed along said second surface.

10. The display of claim 8, wherein:

10 said magnetic component includes a first permanent magnet disposed along said first surface adjacent said first edge and a second permanent magnet disposed along said first surface adjacent said second edge; and  
said energizable coil includes a first coil magnetically coupled with said first magnet and a second coil magnetically coupled with said second magnet.

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11. The display of claim 8, wherein:

20 said magnetic component includes a first permanent magnet disposed along said first surface adjacent said first edge and a second permanent magnet disposed along said second surface adjacent said second surface; and  
said energizable coil includes a first coil magnetically coupled with said first magnet and a second coil magnetically coupled with said second magnet.

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12. The display of claim 1, wherein said magnetic component comprises a carrier having plurality of discrete permanent magnetic particles embedded within said carrier.

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13. In an apparatus comprising an element which carries diffraction grating(s) which element is associated with a source energizable for movement of said element, wherein said diffraction grating(s) are moved by movement of said element and wherein movement of said diffraction grating(s) diffract energy incident on said diffraction grating(s) to generate different select diffracted energies from said diffraction grating(s), the improvement which comprises:

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said element being a faceted, rotatable element (FRE) having an array of facets each facet of said array bearing a diffraction grating, and said FRE having a pivot point;

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said source being fixed relative to said FRE and energizable to cause a select facet of said array to be rotated, by rotation of said FRE about said pivot point,

from a facet resting station to a facet viewing station, whereat a select diffracted energy(s) is generated and displayed to an observer.

- 5      14.    The apparatus of claim 13, wherein said source is a stepper motor.
15.    The apparatus of claim 13, wherein said source is a linear actuator.
- 10    16.    The apparatus of claim 13, wherein said FRE is a plate having a periphery bearing an array of facets, each of said facets comprising a post carrying diffraction grating(s).
17.    The apparatus of claim 13, wherein said FRE includes an arcuate portion bearing said array of facets and a support to which said arcuate portion is connected.
- 15    18.    The apparatus of claim 13, wherein the diffraction grating(s) are holographic diffraction grating(s).
19.    The apparatus of claim 13, wherein said FRE is a plate having a surface and a periphery, said surface bearing said array of facets which are superimposed holographic diffraction grating(s), each facet being angularly offset with respect to each other.
- 20    20.    The apparatus of claim 13, wherein said select diffracted energies are projected by a projection system.
- 25    21.    The apparatus of claim 13, wherein said FRE is rotated about its center.
22.    The apparatus of claim 13, wherein said FRE is rotated about its center of gravity.
23.    The apparatus of claim 13, further including an image surface spaced apart from said FRE upon which said select diffracted energy(s) is focused to create a display.
- 30    24.    In a method for generating different select diffracted energies from an element which carries a holographic pattern of a diffraction grating which element is associated with a source energizable for movement of said element, wherein said holographic pattern is moved by movement of said element and wherein movement of said holographic pattern diffracts energy incident on said holographic pattern to generate different select

diffracted energies from said holographic pattern, the improvement which comprises the steps of:

- (a) providing said element to contain a magnetic component along with said holographic pattern, said element having a pivot point;
- (b) fixing said source relative to said element;
- (c) providing said source as one or more electrically energizable coils;
- (d) magnetically coupling said electrically energizable coil with said magnetic component; and
- (e) energizing said electrically energizable coils to cause said element carrying said holographic pattern to rotate about said pivot point and to generate said different select diffracted energies.

25. The method of claim 24, which includes the step of projecting with a projection system said generated different select diffracted energies onto a surface.

26. The method of claim 24, which further comprises the step of providing said one or more electrically energizable coils as multiple turn coils.

27. The method of claim 24, which further comprises the step of providing said one or more electrically energizable coils as single turn coils.

28. The method of claim 24, which further comprises the steps of:

- (f) providing said magnetic component as a permanent magnet having principal dimensions commensurate with said diffraction grating; and
- (g) affixing said diffraction grating to said permanent magnet.

29. The method of claim 24, which further comprises the steps of:

- (h) providing a carrier having a first surface, a second surface, a first edge, and a second edge; and
- (i) affixing said magnetic component and said diffraction grating to said carrier.

30. The method of claim 29, which further comprises the steps of:

- (j) disposing said diffraction grating along said first surface of said carrier;
- (k) providing said magnetic component as a permanent magnet; and
- (l) disposing said permanent magnet along said second surface.

31. The method of claim 29, which further comprises the steps of:

- (m) providing said magnetic component as a first permanent magnet and a second permanent magnet;
- (n) disposing said first permanent magnet along said first surface adjacent said first edge;
- (o) disposing said second permanent magnet along said first surface adjacent said second edge; and
- (p) providing said energizable coil as a first coil magnetically coupled with said first magnet and a second coil magnetically coupled with said second magnet.

32. The method of claim 29, which further comprises the steps of:

- (q) providing said magnetic component as a first permanent magnet and a second permanent magnet;
- (r) disposing said first permanent magnet along said first surface adjacent said first edge;
- (s) disposing said second permanent magnet along said second surface adjacent said second edge; and
- (t) providing said energizable coil as a first coil magnetically coupled with said first magnet and a second coil magnetically coupled with said second magnet.

33. The method of claim 24, which further comprises the step of providing said magnetic component as a having plurality of discrete permanent magnetic particles embedded within a carrier.

34. In a method for generating different select diffracted energies from an element which carries diffraction grating(s) which element is associated with a source energizable for movement of said element, wherein said diffraction grating(s) are moved by movement of said element and wherein movement of said diffraction grating(s) diffracts energy incident on said diffraction grating(s) to generate different select diffracted energies from said diffraction grating(s), the improvement which comprises the steps of:

- (a) providing said element as a faceted rotatable element (FRE) having an array of facets each bearing a diffraction grating, and said FRE having a pivot point;
- (b) fixing said source relative to said FRE; and
- (c) energizing said source to cause a select facet of said array to rotate, by rotation of said FRE about said pivot point, from a facet resting station to a facet viewing

station, whereat a select diffracted energy(s) is generated for displaying to an observer.

- 5 35. The method of claim 34, which further comprises the step of providing said source as a stepper motor.
36. The method of claim 34, which further comprises the step of providing said source as a linear actuator.
- 10 37. The method of claim 34, which further comprises the step of providing said FRE as a plate having a periphery bearing an array of facets, each of said facets comprising a post carrying a diffraction grating(s).
- 15 38. The method of claim 34, which further comprises the step of providing said FRE having an arcuate portion bearing said array of facets and a support to which said arcuate portion is connected.
- 20 39. The method of claim 34, which further comprises the step of providing said diffraction grating(s) as holographic diffraction grating(s).
40. The method of claim 34, which further comprises the step of providing said FRE as a plate having a surface and a periphery, said surface bearing said array of facets which are superimposed as a holographic diffraction grating(s), each facet being angularly offset with respect to each other.
- 25 41. The method of claim 34, which further comprises the step of projecting with a projection system said generated different select diffracted energies onto a surface.
- 30 42. The method of claim 34, which further comprises the steps:  
(d) providing an image surface spaced apart from said FRE; and  
(e) focusing said generated select diffracted energy(s) onto said image surface to create a display.
- 35 43. The apparatus of claim 13, wherein said FRE is a plate having a surface which bears a holographic diffraction grating of constant spacing and said plate having an axis, said

FRE being rotatable about said axis to a plurality of facet viewing stations to create said array of facets, such that at each facet viewing station a select diffracted energy(s) is generated and displayed to said observer.

- 5    44.    The method of claim 34, which further comprises the steps of:  
providing said FRE as a plate having a surface which bears a holographic diffraction  
grating of constant spacing and said plate having an axis, said FRE being rotatable about  
said axis to a plurality of facet viewing stations to create said array of facets, such that  
at each facet viewing station a select diffracted energy(s) is generated and displayed to  
10    said observer.